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JAPAN · ECONOMIC · INSTITUTE

JEI

REPORT

A Two-Part Report: A and B

NO. 44A November 16, 1990

CHIPPING AWAY: U.S. ACCESS TO JAPAN'S SEMICONDUCTOR MARKET

Summary

The July 1986 semiconductor arrangement took government and industry in the United States and Japan into the uncharted territory of managed trade. This trailblazing attempt to end predatory pricing abroad by Japanese suppliers of commodity memory products and expand sales opportunities in Japan for American competitors initially hit a dead end. The pricing controversy finally was resolved in late 1987, but transpacific wrangling over the market access provisions of the five-year accord continued to detour progress on this front. Only in the last year has the foreign-supplied (mainly American) share of Japan's semiconductor requirements budged from its historical 10 percent level.

That belated progress rules out any chance that offshore manufacturers will reach the agreement's 20 percent market share target by the July 1991 expiration date. Silicon Valley executives, convinced at last that foreign sales in the world's biggest semiconductor market are on track, are willing to give Japan until the end of 1992 to attain the 20 percent figure. But there is a catch: U.S. merchant semiconductor producers want another five-year arrangement to maintain the pressure on Japanese firms to buy foreign and to price fairly. Arguing that the current pact has opened Japan's semiconductor business to overseas suppliers and eliminated the threat of dumping, that country's electronics industry maintains that a new agreement is unnecessary. That is likely to be Tokyo's official position as well. Washington's opposition to managed trade does not automatically doom the U.S. industry proposal, though. Now that a map is available for managing bilateral trade in semiconductors, the Bush administration might decide that a new arrangement is preferable to another free-for-all.

Off to a Contentious Start

The U.S.-Japan semiconductor trade pact, hammered out in July 1986 and signed that September, represented an unprecedented attempt to tackle Japanese trade practices that Silicon Valley and the White House charged were threatening the continued ability of the United States to compete as a world leader in integrated circuits and discrete devices (see JEI Report No. 16A, April 24, 1987). The five-year agreement committed Tokyo to improve market access for foreign producers stymied by the allegedly anticompetitive behavior of Japanese semiconductor users and to end what U.S. industry and government officials said was predatory pricing here and in third markets by Japanese manufacturers of commodity memory products. In exchange, Washington suspended two outstanding dumping complaints against Japanese vendors -- one involving EPROMs (erasable programmable read-only memories) and the other 256-kilobit and higher-density DRAMs (dynamic random access memories). It also suspended the unfair trade practices proceeding initiated by the Semiconductor Industry Association under Section 301 of the 1974 Trade Act.

Instead of moving the United States and Japan beyond their five-year-old fight over the competitive impact on American rivals of Japanese semiconductor trade practices at home and abroad, the 1986 pact almost immediately plunged the two countries into a new controversy over implementation. Compliance issues involving both the pricing and the market access provisions of the accord pitted government against government and trade association against trade association, transforming seemingly natural allies into adversaries.

Charges that Tokyo was not enforcing the pricing part of the agreement surfaced quickly, followed just as quickly by warnings from the Reagan administration that Japan's semiconductor makers had to stop dumping EPROMs and DRAMS overseas, or else. The "or else" turned out to be penalty tariffs levied in April 1987 on $135 million worth of Japanese-made products imported into the United States. Retaliation, a White House first, worked. By early November 1987 U.S. government and industry officials were satisfied that commodity memory devices were being priced at fair market values both in this country and in third markets. The sanctions were lifted.

The same initial sequence of events unfolded on the market access issue -- early complaints about implementation, threats of reprisals if progress did not occur quickly and penalty tariffs to the tune of $165 million in April 1987 for Japan's failure to improve foreign access to its semiconductor business. The outcome was entirely different, however. The dumping-related sanctions succeeded in large part because the Ministry of International Trade and Industry had tools at its disposal to prod Japanese suppliers into compliance with the trade pact's pricing provisions. Without this backup on the market access side the punitive duties proved no more effective than the 1986 agreement itself in persuading Japanese semiconductor customers to boost purchases from American manufacturers. At best the sanctions -- which remain in effect to this day -- helped U.S. competitors in the boom market of 1987 and 1988 to recapture the roughly 10 percent of Japanese demand they traditionally had supplied before losing ground during the 1985-86 worldwide semiconductor slump.

The JEI REPORT (ISSN 0744-6489) is published weekly except for the New Year, Memorial Day, Labor Day, Thanksgiving and Christmas holiday weeks for $40 per year by the Japan Economic Institute of America, 1000 Connecticut Avenue, N.W., Washington, D.C. 20036. Second class postage paid at Washington, D.C. POSTMASTERS: Send address changes to JEI REPORT, 1000 Connecticut Avenue, N.W., Washington, D.C. 20036.

With American companies barely filling their historical share of Japan's semiconductor requirements, the Semiconductor Industry Association and the Electronic Industries Association of Japan realized they both had a practical interest in backstopping the efforts of individual U.S. suppliers and Japanese customers interested in expanding business ties. Three industry-to-industry meetings were held between June 1987 and the following June to work out a joint program of action, but each of these sessions ended in controversy over exactly what Tokyo had promised in the market access section of the trade agreement.

In retrospect, this infighting probably should have been expected, at least at first, given the high stakes for both sides and the broadbrush language of the publicly released accord. While SIA had made it clear during the nine months of negotiations leading up to the agreement that its yardstick for success was a 20 percent U.S. share of Japan's semiconductor market by the arrangement's end in July 1991, the pact neither mentioned a target Japanese market share for American semiconductor makers nor guaranteed greater U.S. sales in Japan. All it specified was that Washington and Tokyo anticipated a "steady increase in access" over the agreement's five-year term.

In the 1987 and 1988 meetings American industry executives contended that Tokyo had recognized SIA's market share expectations when it signed the trade agreement. That acknowledgment, they hinted, was contained in a confidential side letter to the pact. EIAJ officials repeatedly denied that the Japanese government had made any promises, written or otherwise, about a market share figure for American suppliers. Publication of the side letter in 1988 did not end this dispute since the relevant language was open to interpretation: "The Government of Japan recognizes the U.S. semiconductor industry's expectation that semiconductor sales in Japan of foreign capital-affiliated companies will grow to at least slightly above 20 percent of the Japanese market in five years. The Government of Japan considers this can be realized and welcomes its realization."

Mirroring what happened when representatives of the two governments got together during this period, SIA and EIAJ went around and around on whether this wording constituted the equivalent of a guarantee, the U.S. position, or a goal, as the Japanese maintained. The two sides also got hung up on how to track the "steady increase in access" called for in the public part of the arrangement. SIA's leadership argued that "steady" meant something close to a straight-line expansion in market share. Spokesmen for the Japanese trade group rejected this argument -- the basis for SIA claims that Japan was not living up to its market access commitments, saying that nothing in the agreement entitled foreign suppliers to a linear gain in market share.

The size of the foreign market share and how to calculate it sidetracked SIA and EIAJ as well. Washington and Tokyo had agreed in initialing the trade pact to develop a new method for measuring access to avoid controversy on this critical point. In the meantime, they indicated, the two sides would use data collected by MITI on semiconductors purchased by 63 big Japanese users from foreign-headquartered companies and shipment information generated by World Semiconductor Trade Statistics Inc., a reporting program covering 60 American, European and Japanese suppliers. Still in place today, that stopgap solution gave immediate rise to transpacific sparring because the quarterly MITI figures on the share of Japan's semiconductor business won by foreign-based manufacturers run anywhere from 2 to 4 percentage points higher than the comparable WSTS numbers (see Table 1).

Table 1: Foreign Share and Sales in Japan's Semiconductor Market

	WSTS/Foreign Share	MITI/Foreign Share	MITI/Foreign Sales (billion yen)	MITI/Foreign Sales (million dollars)	SIA/United States Share	SIA/United States Sales (million dollars)
1986: I	n.a.	n.a.	n.a.	n.a.	8.0%	$178.7
II	n.a.	n.a.	n.a.	n.a.	8.5	224.0
III	8.6%	10.3%	¥38.6	$248.0	8.4	241.9
IV	8.7	11.1	38.0	237.0	8.5	230.8
1987: I	8.8	12.2	35.8	234.0	8.6	229.8
II	9.2	12.8	39.1	274.0	9.0	268.7
III	10.1	12.5	48.3	329.0	9.8	318.7
IV	10.2	12.4	52.6	389.0	10.0	384.1
1988: I	10.3	12.2	52.4	409.0	10.7	426.8
II	10.4	12.9	58.5	465.0	10.6	473.2
III	10.9	13.0	65.6	490.0	11.1	501.1
IV	10.6	13.2	67.7	540.0	10.5	533.3
1989: I	10.9	13.2	67.4	523.0	10.7	511.1
II	11.5	14.9	76.8	555.0	10.8	524.2
III	12.0	15.9	81.0	569.0	11.2	533.7
IV	12.9	16.3	87.8	614.0	12.1	576.6
1990: I	13.0	17.2	83.8	564.0	12.2	531.3
II	13.3	17.5	92.5	597.0	12.5	559.3

Both data series track integrated circuits and discrete devices made by American and other foreign-based semiconductor producers and sold in Japan. Whether the product is manufactured at home, in Japan or in third countries is immaterial; all that counts is the nationality of the supplier. (By definition, therefore, imports from the offshore subsidiaries of Japanese semiconductor makers are excluded from the two sets of statistics.) MITI and WSTS also treat the output of foreign-affiliated companies in Japan similarly, counting a product as foreign if the foreign parent owns 50 percent or more of the manufacturing operation.

The biggest of the several methodological differences between the two organizations is how they handle chip production and imports by IBM Japan Ltd. In line with U.S. thinking, WSTS excludes these numbers on the grounds that IBM Japan uses all of the huge volume of devices it makes or imports from its parent in-house. MITI, however, includes them -- a move that accounts for perhaps half of the gap between its foreign market share statistics and WSTS's. Most of the rest reportedly reflects divergent methods for calculating the size of the Japanese semiconductor market, the ratio's denominator, with WSTS's figure topping MITI's by roughly 10 percent.

Moving Beyond Debates

Industry and government on both sides of the Pacific spent vast amounts of energy playing the various versions of the numbers game during the first

half of the five-year semiconductor trade pact. By late spring 1989, however, the tone of bilateral meetings, both trade association-sponsored and at the official level, had changed. The charges and countercharges did not disappear entirely, but the two sides managed to put their differences aside long enough to come up with initiatives designed to facilitate U.S. sales of semiconductors in Japan.

Why the change in atmosphere? Some tough talk by the new Bush administration's top trade officials, U.S. Trade Representative Carla Hills and Commerce Secretary Robert Mosbacher, certainly played a role. Their statements that Japan had promised American companies 20 percent of the semiconductor market by 1991 and their willingness to consider additional sanctions to ensure compliance with this pledge no doubt helped persuade Japanese industry and government officials that, rightly or wrongly, a 20 percent U.S. market share was the standard by which Washington would judge the success of the trade agreement.

The catalyst, though, appeared to be SIA's decision to lobby the White House to make semiconductors a U.S. trade-liberalization priority under the Super 301 provision of the 1988 trade act. The trade group knew its March 1989 campaign could backfire. Any doubts were dispelled when Japanese industry representatives and government officials separately warned the administration that naming semiconductors a priority trade practice would entitle Tokyo to cancel the 1986 agreement. But executives of U.S. companies producing ICs and discrete devices were willing to run this risk to drive home the message that American competitors were dissatisfied with their access to Japan's market.

SIA's gamble paid off. Although semiconductors did not make the White House's final May 1989 list of priority Japanese trade practices, the strong possibility that they might have been cited accomplished what the April 1987 sanctions and the threat of additional retaliation had not achieved: it spurred the Japanese side to action. Over the last 18 months EIAJ and SIA, working alone or in tandem, have mapped out multiple initiatives to facilitate the development of long-term relationships between U.S. semiconductor suppliers and Japanese semiconductor customers -- recognized by both groups as the key to breaking the business-as-usual habits of Japan's volume chip users and getting existing and/or new American parts designed into final products.

The two trade organizations have targeted many of their efforts at Japanese consumer electronics and automotive manufacturers, huge user groups that traditionally have been hard sells for foreign makers. An EIAJ-SIA task force on consumer electronics, organized in June 1989, conducted three surveys to assist American producers in planning their Japanese marketing strategies, including a projection of Japanese market growth by consumer product line through 1995, a review of the suitability of U.S. semiconductors for Japanese consumer electronics products and a study of Japanese chip packaging requirements. A separate committee was set up that November to help American companies get in on the ground floor of the potentially big market for ICs in high-definition television equipment by, for example, hosting technical symposia. In June 1990 EIAJ and SIA, together with the Japan Automobile Parts Industries Association, established a task force on automotive semiconductors.

While the two trade associations were running interference for U.S. competitors in the consumer and automotive fields, the User's Committee of Foreign

Semiconductors -- an EIAJ-backed group comprising 57 companies that together generate roughly 70 percent of Japan's semiconductor demand -- was organizing purchasing missions and other face-to-face contacts between Japanese users and American suppliers. Washington and Tokyo also arranged a December 1989 U.S. buying mission. Some of Japan's largest chip users sent their own procurement teams to the United States to purchase existing products or contract with U.S. makers for the development of customized circuits. MITI, meanwhile, stepped up its jawboning of major semiconductor buyers, urging them to expand purchases of foreign products, set up in-house groups responsible for promoting the use of foreign semiconductors, devise and publicize annual purchasing plans, and sign more design-in contracts with offshore manufacturers.

Bumping Up Against Deadlines

Will these moves and other industry, company and government initiatives enable American and other foreign manufacturers to win 20 percent of Japan's semiconductor business by next July? If steps like these had been taken in the first year of the semiconductor trade pact instead of the fourth or fifth, U.S. corporate executives say, foreign competitors certainly would have had a fighting chance. Now it's too late. The numbers are moving in the right direction, whether the gauge is WSTS's or MITI's market share figures or the apparent consumption statistics presented in the Appendix, but too much ground still must be covered. Design-in arrangements -- near the top of the list of strategies for U.S. suppliers trying to make Japanese market inroads -- take 12 months or more to produce volume shipments, and many of these contracts were signed only this year. In any event it is not clear that enough design-in deals with American suppliers have been signed to have a noticeable effect on the market share numbers. The only aggregate data available, collected by MITI, date back just to the start of 1989, and these quarterly figures do not yet show a sustained increase.

Japanese corporate executives have doubts that earlier efforts on their part would have put American semiconductor makers within striking distance of a 20 percent Japanese market share by now. U.S. producers might supply 52.4 percent (1989) of world semiconductor demand outside Japan, they note, but these companies operate with multiple handicaps in the world's largest semiconductor market. For starters, Japan's biggest users of ICs and discrete devices also are its biggest semiconductor manufacturers, supplying a substantial portion of their requirements internally. This situation, however, has not been the major obstacle that some people anticipated. The largest of the huge, vertically integrated electronics companies have been far more willing to source semiconductors from foreign vendors than their smaller counterparts and other second- or third-tier semiconductor users that do not have an in-house supply capability, such as the automotive firms.

For example, NEC Corp., the world's top semiconductor maker last year, already gets from foreign firms 20 percent or so of the reported $1.3 billion worth of chips it buys a year from outside suppliers, and it expects to reach the 24 percent level by next July. Likewise, Mitsubishi Electric Corp., the number-five semiconductor manufacturer, and Oki Electric Industry Co., Ltd., another Big 10 producer, are at or above the 20 percent mark. Toshiba Corp., which vies with NEC for semiconductor industry leadership, expects to reach the target market share number during the current fiscal year. The same goes for Hitachi, Ltd., the third-biggest maker, and number-four Fujitsu, Ltd. Sony

Corp., also among Japan's 10 largest semiconductor companies, says it will be there by July 1991. So does Matsushita Electric Industrial Co., Ltd., the sixth-largest producer, which, along with its group companies, purchases about the same volume of semiconductors from outside vendors as NEC does.

Then there's the mismatch problem -- shorthand in Japan for the fact that the U.S. semiconductor industry's product strengths do not jibe well with Japanese requirements. Roughly one-third of all semiconductors used in Japan go into consumer electronics products, particularly videocassette recorders, audio equipment and television sets -- a sector that generates perhaps 4 percent of demand in this country. Consumer electronics products require significant quantities of custom and semicustom chips, which explains why most well-known Japanese makers of this equipment also are in the semiconductor business. American producers still are strong in ASICs (application-specific ICs or chips tailored to the needs of customers) despite mounting pressure from their Japanese rivals, but they must get their foot in the door to parlay this strength. Consumer electronics products also use large volumes of discrete devices, an area where U.S. makers have substantial production capability. Japanese companies say, however, that much of what is made is unsuited to their requirements because the packaging is not right.

The other big semiconductor end-use markets in Japan are computers and telecommunications equipment; together they account for roughly half of all demand versus just under two-thirds in the United States. By one count 40 percent of the chips used by Japanese makers of data-processing and telecommunications equipment are memory products. Some of these requirements are for EPROMs and SRAMs (static RAMs), products in which the United States is very competitive, especially in the high-speed area. But the parts in greatest demand are DRAMs, and this is where the U.S. industry comes up short both at home and in Japan. (Why is one of the sticking points between the two countries.) Only three American semiconductor makers are in the merchant DRAM business today -- Texas Instruments Inc., Motorola, Inc. and Micron Technology Inc.; they produce a modest 10 percent or so of the world DRAM supply compared to an overwhelming 80 percent-plus share for their Japanese rivals. Moreover, the vast majority of DRAMs made by the American trio goes to domestic customers worried about total dependence on Japanese semiconductor makers that often are competitors in the computer or the telecommunications equipment fields.

While the limited U.S. DRAM presence unquestionably hamstrings the ability of domestic companies to compete for the large semiconductor business of Japanese computer and telecommunications equipment manufacturers, an estimated 60 percent of their requirements potentially is up for grabs. Most of this demand is for microprocessors, microcontrollers and related chips or for other logic products. These are areas in which American competitors still excel despite concerted efforts by their Japanese rivals. Intel Corp., Motorola and other U.S. makers remain the Japanese market leaders in both older-technology 8- and 16-bit MPUs and current-generation 32-bit MPUs. EIAJ executives concede as much but argue that U.S. strengths in MPUs and other CMOS (complementary metal-oxide-silicon) logic and memory devices do not compensate fully for American shortcomings in DRAMs or specialized consumer electronics parts.

Japanese industry leaders also question the commitment of American semiconductor manufacturers to the Japanese market in wondering aloud whether a 20 percent market share is a realistic figure for U.S. companies. These often-expressed doubts rile American makers. Top merchant suppliers say they have

invested considerable resources -- both financial and personnel -- in their Japanese marketing and support operations since the signing of the semiconductor trade pact even though there was little prospect of a short-term payoff. A September 1989 SIA study indicated that U.S. merchant makers had opened 28 sales offices, 13 design centers and four testing and failure analysis centers in the postagreement period, boosting the number of Japan facilities to 67 sales offices, 18 design centers and 26 testing and failure analysis centers.

An independent survey by the Japan Economic Institute provides additional evidence of a strong and increasing U.S. commitment to the Japanese semiconductor market (see Table 2). At least 25 merchant manufacturers have Japanese semiconductor sales subsidiaries, and 13 operate design centers. The top five U.S. semiconductor companies -- Motorola, Texas Instruments, Intel, National Semiconductor Corp. and Advanced Micro Devices, Inc. -- have had Japanese marketing operations since the late 1960s or the first half of the 1970s. Like other American semiconductor makers with a long-established Japanese marketing presence, these suppliers use both direct sales forces operating out of multiple offices and distributors to sell their products; all of them have taken steps since the trade pact went into effect to bolster this network. TI, for example, now runs nine sales offices in Japan and works with 10 distributors; Intel has six sales agents.

Big American chipmakers have paid particular attention in recent years to the design side of their Japanese business, more convinced than ever that a strong in-country design capability is the key to expanded sales. These firms have hired additional engineers and other technical personnel and installed new computer-aided engineering equipment to demonstrate to consumer electronics manufacturers and other volume buyers of custom and semicustom chips that they want some of these orders.

EIAJ executives long have argued, however, that it will take more than extra effort by the biggest American merchant producers to raise the U.S. semiconductor share in Japan. The five largest suppliers already generate the vast majority of American sales in Japan, they note; to boost this figure smaller companies must get more involved. In fact, second- and third-tier merchant makers have accounted for a significant part of the Japan-related investment activity since the signing of the trade pact. Three Fortune 100 companies that make chips for outside sale -- American Telephone & Telegraph Co., Raytheon Co. and Rockwell International Corp. -- spun off their Japanese semiconductor marketing operations from their Tokyo headquarters in the late 1980s and formed dedicated sales subsidiaries. More significant perhaps, at least seven Silicon Valley start-ups have opened Japanese sales subsidiaries, gambling that the high cost of this move relative to their revenues will pay off in the long run.

Moreover, small but strong niche players that decide they cannot justify the cost of a sales subsidiary and/or design center are not at a competitive disadvantage in the Japanese market if they sign up with the right distributor. Unlike their American counterparts, the major Japanese distributors provide design services for customers and have the equipment to do quality assurance testing and failure analysis; they also afford small merchant makers some financial protection. Micron Technology, which had not sold its products in Japan since closing its sales subsidiary there in late 1985, tried a different tack. A year ago it gave Sanyo Electric Co., Ltd. exclusive Japanese distribution rights to its complete line of DRAMs, SRAMs and video RAMs.

Table 2: U.S. Merchant Semiconductor Manufacturers With Japanese Sales Subsidiaries

Parent	Subsidiary	Year Opened	Main Semiconductor Product Lines	Design Center		
				Year Opened	Location	Products
Texas Instruments Inc.	Texas Instruments Japan Ltd.	1968	MOS memory; MOS logic; bipolar logic; bipolar memory	1969 1980 1986	Tokyo Miho Hiji	Full range of custom and semicustom products, mainly for in-house use - also has regional technology centers in Tokyo and Osaka that provide similar services for customers
Motorola, Inc.	Nippon Motorola Ltd.	1968	MOS logic; MOS memory; bipolar logic	1970s 1989	Tokyo Osaka	Full range of custom and semicustom products for in-house and customer use
Analog Devices, Inc.	Analog Devices K.K.	1969	Digital-to-analog/analog-to-digital converters	1982	Shiroyama	D-A/A-D converters
National Semiconductor Corp.	National Semiconductor Japan Ltd.	1972	Analog circuits; bipolar logic; MOS logic; microprocessors, microcontrollers, imagining/peripheral circuits	1980	Tokyo	CLASIC products
Advanced Micro Devices, Inc.	Advanced Micro Devices K.K.	1974	Microprocessors, microcontrollers/ peripheral circuits; bipolar logic; analog circuits; programmable logic devices	1987	Atsugi	Semicustom products
Signetics Corp.	Philips Japan Ltd.	1975	Linear circuits; bipolar logic; microprocessors, microcontrollers/peripheral circuits	1981	Tokyo	Analog circuits; microprocessors/ microcontrollers
Intel Corp.	Intel Japan K.K.	1976	Microprocessors, microcontrollers/ peripheral circuits; EPROMs; flash memories	1980	Tsukuba	MOS logic/memory products
Zilog, Inc.	Zilog Japan K.K.	1977	Microprocessors, microcontrollers/ peripheral circuits, incl. communications devices; application-specific standard products	--	--	--
Sprague Technologies Inc.	Sprague Japan K.K.	1981	Power/smart power circuits; Hall-effect/ smart Hall-effect circuits	--	--	--
LSI Logic Corp.	LSI Logic K.K.	1984	MOS logic	1984	Tokyo	ASIC products
Linear Technology Corp.	Linear Technology K.K.	1985	Analog circuits; regulator chips; OpAmps	--	--	--
International Rectifier Corp.	International Rectifier Far East Ltd.	1986	Field-effect transistors; power circuits	--	--	--
VLSI Technology Inc.	VLSI Technology K.K.	1986	ASIC products	1986 1990	Tokyo Osaka	ASIC products ASIC products

Table 2: U.S. Merchant Semiconductor Manufacturers With Japanese Sales Subsidiaries (continued)

Parent	Subsidiary	Year Opened	Main Semiconductor Product Lines	Design Center		
				Year Opened	Location	Products
Integrated Device Technology Inc.	Integrated Device Technology K.K.	1987	SRAMs; MOS specialty memories; microprocessors; MOS logic	--	--	--
Standard Microsystems Corp.	Toyo Microsystems Corp.	1987	ASIC products	1987	Tokyo	ASIC products
Raytheon Co.	Raytheon Semiconductor International Co.	1987	Digital/analog ASIC products; linear standard circuits; PROMs; signal devices	1989	Tokyo	ASIC ECL/ASIC analog products
Sipex Corp.	Nippon Sipex Corp.	1987	Digital-to-analog converters	--	--	--
American Telephone & Telegraph Co.	AT&T Microelectronics	1988	ASIC products; digital signal processors; SRAMs; ISDN circuits; small power supplies; lightwave products	1989	Tokyo	MOS/bipolar products
Rockwell International Corp.	Rockwell International Japan Co., Ltd.	1988	Communications devices, especially for data modem and facsimile applications	1989	Tokyo	Communications devices
Xicor, Inc.	Xicor Japan K.K.	1988	Nonvolatile memories	--	--	--
Cypress Semiconductor Corp.	Nippon Cypress K.K.	1988	SRAMs	--	--	--
Lattice Semiconductor Corp.	Lattice Semiconductor Corp. Japan	1989	Programmable logic devices	--	--	--
Xilinx Inc.	Xilinx K.K.	1989	Field-programmable gate arrays	--	--	--
Cirrus Logic Inc.	Cirrus Logic K.K.	1989	Disk, graphics/data communications controller circuits	--	--	--
Altera Corp.	Altera Japan K.K.	1990	Electrically programmable logic devices	--	--	--

Source: Japan Economic Institute survey.

While labeling recent moves by big U.S. merchant makers and small industry members alike as steps in the right direction, the conventional wisdom in Japan is that American semiconductor producers will remain marginal players in the world's largest chip market unless they have a production capability there. Four companies now have Japanese plants: pioneering TI, which operates three wafer fabrication-assembly and test complexes; Motorola, which also has a wholly owned integrated facility but additionally is an equal partner with Toshiba in a front end; Analog Devices, Inc. (an assembly and test plant); and LSI Logic Corp., which runs a front end with Kawasaki Steel Corp. (see Table 3). The other major U.S. merchant suppliers have concluded that their near-term sales prospects in Japan do not justify the several hundred million dollars it costs to build a front end, particularly when they have ample, often new, wafer fabrication capacity in this country and elsewhere. The counterargument -- that Japanese sales never may be large enough to justify a plant without building the plant first -- does not sway them. Texas Instruments and Motorola still are not able to break from the pack of also-rans in Japan despite having made all the supposedly right moves, these companies note.

Texas Instruments, however, is making another attempt. Next year it will round out its Japanese operations with the opening of a research and development center at Tsukuba, northeast of Tokyo. Expected to cost $40 million for the first of several phases to be built over the next few years, the facility will focus on new process technologies and ICs potentially applicable to advanced consumer electronics products, including high-definition television, computers, telecommunications equipment and motor vehicles. As the first American electronics company to set up a R&D center in the country, TI hopes to convince Japanese semiconductor users at last of its commitment to the market.

This investment decision has been applauded by U.S. industry analysts, but a number of them have reservations about TI's lastest Japan-related move, a plan to build a $350 million wafer fab with Kobe Steel, Ltd. A minority partner in the operation, TI will supply design and manufacturing technologies for CMOS logic devices and get all of the plant's output; Kobe Steel, in its maiden venture into semiconductor production, will put up most of the money. The American company described the March 1990 deal as "the latest in a series of creative arrangements by TI to add production capability in various regions of the world while reducing the financial risk inherent in the addition of large amounts of new capacity."

While the partnership with Kobe Steel might make eminent financial sense to Texas Instruments, critics point out that the steelmaker gets access to advanced U.S. technology. This raises the possibility of more cutting-edge American know-how being transferred to Japan's electronics industry, they say. Similar warnings were issued in late 1986 when Motorola unveiled plans to transfer its microprocessor technology indirectly to Toshiba through their now operational Japanese production venture in exchange for help in getting back into the DRAM business. They were heard again at the end of 1988 when TI agreed to cooperate with Hitachi on the development of a 16-megabit DRAM device, as well as other times in recent years that U.S. semiconductor companies have announced technology transfer or joint development arrangements with Japanese rivals.

Repeating what they said when the Hitachi deal was announced, TI executives say that the pact with Kobe Steel has been structured to provide strong protection for the company's technology. Motorola takes the same position on

Table 3: U.S. Merchant Semiconductor Manufacturers With Japanese Production Facilities

Subsidiary/ Parent	Location	Year Opened	Processes	Products	Comments
Texas Instruments Japan Ltd. Texas Instruments Inc. - 100%	Hatogaya, Saitama	1968	Wafer fabrication, assembly and test	MOS logic products	Roughly four-fifths of the products Texas Instruments makes in Japan are sold there.
	Hiji, Oita	1973	Wafer fabrication, assembly and test	Bipolar logic/memory products	
	Miho, Ibaraki	1980	Wafer fabrication, assembly and test	MOS memory products	
Nippon Motorola Ltd. Motorola, Inc. - 100%	Aizu, Fukushima	1980	Wafer fabrication, assembly and test	MOS/bipolar logic products; MOS memory products	Plant's output expected to be doubled by 1994 after being expanded 50 percent in 1987.
Analog Devices K.K. Analog Devices, Inc. - 100%	Shiroyama, Kanagawa	1982	Assembly and test	Digital-to-analog/analog-to-digital converters and related circuits	Wafers are imported from United States and Ireland. Factory assembles about half of the products Analog Devices sells in Japan.
Nihon Semiconductor Inc. LSI Logic Corp. - 55% Kawasaki Steel Corp. - 45%	Tsukuba, Ibaraki	1987	Wafer fabrication	Silicon wafers; ASIC products	Plant's output is marketed by LSI Logic in Japan, the United States and other markets.
Tohoku Semiconductor Corp. Motorola, Inc. - 50% Toshiba Corp. - 50%	Sendai, Miyagi	1988	Wafer fabrication	MOS memory (DRAM)/logic (MPU) products	Motorola contributed designs and technology for broad range of microprocessors, while Toshiba transferred DRAM and SRAM designs and technology. Plant makes 1-megabit DRAMs for Motorola and 8- and 16-bit MPUs for Toshiba.
Nippon Motorola Ltd. Motorola, Inc. - 100%	Sendai, Miyagi	1991*	Assembly and test	MOS memory (DRAM)/logic (MPU) products	Wafers will be supplied from adjacent Tohoku Semiconductor front end.
KTI Semiconductor Ltd. Texas Instruments Inc. - 25% Kobe Steel, Ltd. - 75%	Nishiwaki, Hyogo	1992*	Wafer fabrication	CMOS logic devices, including ASIC/VLSI circuits	All wafers will be supplied to Texas Instruments Japan for resale in Japan and abroad. TI is providing product and process technologies, while Kobe Steel is financing most of the plant's cost.

*Planned.

Source: Japan Economic Institute survey.

its five-year agreement with Toshiba. But even if the technology safeguards in these and other arrangements with Japanese manufacturers prove effective, U.S. industry analysts still worry that the high and rising costs of R&D and production in the semiconductor business will tempt merchant makers to substitute tie-ups with deep-pocketed Japanese firms for their own efforts. That outcome, they say, could undercut the competitive position of the critical U.S. semiconductor industry.

A New Trade Pact?

Despite their complaints over the years about Japanese implementation of the terms of the semiconductor trade pact, U.S. merchant makers still believe they made the right decision in 1986 when they opted for this arrangement rather than statutory trade relief. The agreement, they readily admit, ended Japanese pricing pressures on surviving American producers of DRAMs and EPROMs and eliminated the threat of dumping in ASICs, MPUs and several other products subject to price monitoring. SIA also argues that the modest inroads U.S. suppliers have made in Japan's semiconductor market over the last 12 months or so would not have occurred without the accord.

That assessment persuaded the trade association's leadership months ago that some type of institutional framework had to be kept in place after the July 1991 expiration of the trade agreement if U.S. manufacturers ever were to be more than bit players in Japan's semiconductor market. The big question was how to get ongoing market access help as well as continued relief on the pricing front. The 1986 pact said nothing about extension, leaving negotiation of another arrangement the only alternative. Industry officials knew this was easier said than done since a SIA campaign for a new agreement most certainly would encounter stiff resistance on all sides.

Big domestic chip users, especially computer manufacturers, have been unhappy with the semiconductor trade pact from the start, blaming its pricing provisions for initially short supplies of commodity memory products on the American market and artificially high DRAM and EPROM prices to this day. The Bush administration's frequent arguments against managed trade also put it in the opposition camp. Industry and government in Japan were sure to oppose a new agreement as well given the widespread belief there that Japanese semiconductor makers and users have done more than their fair share to help U.S. merchant manufacturers.

SIA decided to tackle opponents of a new trade pact in order. Trade association representatives began meeting early this year with members of the Computer Systems Policy Project, a group of 11 leading U.S. computer makers, to try and find common ground. After months of give-and-take the two organizations came up with a unified position in early October. In a joint letter to President Bush SIA and CSPP urged the White House to seek a new five-year semiconductor trade pact with Japan effective August 1, 1991. Bowing to the computer makers, semiconductor suppliers agreed to give up fair market value floor prices on imports of Japanese-made DRAMs and EPROMs and rely instead on a fast-track antidumping mechanism for pricing protection. In exchange, SIA won CSPP support for its market access initiatives.

Under the joint proposal Japan would be given an extra 17 months, or until December 1992, to fill its 20 percent foreign market share "commitment." If

offshore suppliers do not win this cut of Japan's semiconductor business by the end of the grace period, the White House should take appropriate action, the two trade groups said without indicating what those steps might be. Then in 1993 Washington and Tokyo would decide whether new, presumably higher, quantitative targets needed to be set to continue progress toward an open Japanese semiconductor market. Questioned on this point at a press conference announcing the joint proposal, SIA and CSPP representatives refused to say whether they thought the new targets should be set in terms of market share.

The top EIAJ official immediately rejected the proposed new trade pact, saying another arrangement is unnecessary. That certainly is not the last word from the Japanese side. U.S. semiconductor industry executives know, however, that even if Tokyo were to agree to discuss another accord -- certainly a long shot -- a push for a fixed foreign market share figure could scuttle the talks. First, though, merchant makers must sell the SIA-CSPP proposal to the Bush administration. Ironically, Washington watchers think the pricing parts of the suggested new arrangement could present more problems than the managed trade thrust of the market access sections. Whether they are right will be known in the next few months.

For further information, contact Susan MacKnight.

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The views expressed in this report are those of the author and do not necessarily represent those of the Japan Economic Institute.

JEI Report will not be published November 23, 1990 because of the Thanksgiving holiday. The next issue will be dated November 30, 1990.

APPENDIX

Table 1: Japan's Apparent Domestic Consumption of Semiconductors, 1985-90*

	1985	1986	1987	1988	1989	Six Months 1990
	(in millions of yen)					
Total Production	Y2,409,703	Y2,332,811	Y2,486,839	Y3,119,104	Y3,594,137	Y1,708,037
Total Exports (f.o.b.)	696,556	639,268	723,779	1,014,521	1,336,675	661,102
Total Imports (c.i.f.)	199,424	172,763	189,082	256,737	351,659	205,984
Trade Balance	497,132	466,505	534,697	757,784	985,016	455,118
Apparent Domestic Consumption	1,912,571	1,866,306	1,952,142	2,361,320	2,609,121	1,252,919
Exports as Percent of Apparent Domestic Consumption	36.4%	34.3%	37.1%	43.0%	51.2%	52.8%
Imports as Percent of Apparent Domestic Consumption	10.4%	9.3%	9.7%	10.9%	13.5%	16.4%
Exports to United States (f.o.b.)	248,325	185,937	217,008	313,912	461,391	220,824
Imports from United States (c.i.f.)	136,093	117,865	126,529	175,857	232,795	139,700
Trade Balance	112,232	68,072	90,479	138,055	228,596	81,124
Exports to United States as Percent of Apparent Domestic Consumption	13.0%	10.0%	11.1%	13.3%	17.7%	17.6%
Imports from United States as Percent of Apparent Domestic Consumption	7.1%	6.3%	6.5%	7.4%	8.9%	11.1%
	(in thousands of dollars)					
Total Production	$10,101,882	$13,842,933	$17,193,301	$24,339,477	$26,052,022	$11,268,221
Total Exports (f.o.b.)	2,898,814	3,760,621	4,960,788	7,917,904	9,732,598	4,383,094
Total Imports (c.i.f.)	830,345	1,015,775	1,294,993	2,003,410	2,561,992	1,366,757
Trade Balance	2,068,469	2,744,846	3,665,795	5,914,494	7,170,606	3,016,337
Apparent Domestic Consumption	8,033,413	11,098,087	13,527,506	18,424,983	18,881,416	8,251,884
Exports to United States (f.o.b.)	1,033,439	1,093,811	1,487,375	2,449,949	3,359,480	1,464,059
Imports from United States (c.i.f.)	566,653	692,997	866,578	1,372,275	1,696,015	926,946
Trade Balance	466,786	400,814	620,797	1,077,674	1,663,465	537,113

*Neither Japan's production data nor its trade data include wafers, dice or parts.

Source: Derived from following tables.

Table 2: Japan's Production of Semiconductors, 1985-89

(value in millions of yen*; quantity in thousands of units)

	1985	1986	1987	1988	1989
Value					
Integrated Circuits	Y1,841,790	Y1,780,235	Y1,925,000	Y2,489,897	Y2,941,597
Analog	350,333	336,953	341,646	361,785	379,171
For Industrial Equipment	70,588	83,764	112,797	119,086	117,639
For Consumer Goods	279,745	253,189	228,849	242,699	261,532
Digital Bipolar	256,076	273,379	262,450	272,519	226,676
Logic	214,827	230,042	218,296	219,243	186,535
Memories	41,249	43,337	44,154	53,276	40,141
Digital MOS	1,070,965	1,000,919	1,137,813	1,629,630	2,097,461
Logic	482,095	484,848	567,754	708,680	944,600
Microprocessors, Microcontrollers and Peripheral Chips	n.a.	n.a.	239,674	280,593	398,190
Other	n.a.	n.a.	328,080	428,087	546,410
Memories	588,870	516,072	570,059	920,951	1,087,695
RAMs	n.a.	n.a.	n.a.	n.a.	900,607
ROMs	n.a.	n.a.	n.a.	n.a.	187,088
Other	n.a.	n.a.	n.a.	n.a.	65,166
Hybrid	164,417	168,983	183,091	225,962	238,289
Discrete Devices	567,913	552,576	561,839	629,207	652,540
Transistors	206,205	196,015	201,470	230,906	242,862
Diodes and Rectifiers	142,752	139,890	139,467	151,152	150,785
Other	218,956	216,671	220,902	247,149	258,893
Total Production	2,409,703	2,332,811	2,486,839	3,119,104	3,594,137
Quantity					
Integrated Circuits	9,350	11,139	12,015	14,296	15,083
Analog	3,624	3,959	4,372	5,185	5,782
For Industrial Equipment	646	1,040	1,330	1,698	1,827
For Consumer Goods	2,978	2,919	3,042	3,487	3,955
Digital Bipolar	1,882	2,380	2,307	2,377	1,860
Logic	1,838	2,334	2,255	2,315	1,827
Memories	44	45	52	61	33
Digital MOS	3,485	4,373	4,878	6,197	6,849
Logic	2,358	2,896	3,453	4,435	5,092
Microprocessors, Microcontrollers and Peripheral Chips	n.a.	n.a.	851	1,135	1,411
Other	n.a.	n.a.	2,602	3,300	3,682
Memories	1,127	1,477	1,425	1,762	1,724
RAMs	n.a.	n.a.	n.a.	n.a.	1,299
ROMs	n.a.	n.a.	n.a.	n.a.	424
Other	n.a.	n.a.	n.a.	n.a.	33
Hybrid	360	428	459	538	592
Discrete Devices	38,283	43,022	46,906	54,075	56,720
Transistors	14,343	15,769	16,722	19,980	22,326
Diodes and Rectifiers	18,702	20,510	22,445	25,828	25,574
Other	5,237	6,743	7,739	8,268	8,821

*The following average annual exchange rates, calculated by the Ministry of Finance, can be used to convert the yen production figures into dollars: 1985, Y238.54; 1986, Y168.52; 1987, Y144.64; 1988, Y128.15; and 1989, Y137.96.

Source: Japan, Ministry of International Trade and Industry, Yearbook of Machinery Statistics.

Table 3A: Japan's Total Exports of Semiconductors, 1985-90

(in millions of yen*)

	1985	1986	1987	1988	1989	Six Months 1990
Integrated Circuits (excl. parts)	Y581,801	Y523,131	Y592,373	Y845,707	Y1,147,781	Y561,673
Packaged	486,169	436,030	500,029	713,817	954,493	465,773
Analog	]			106,495	124,772	69,028
Digital Bipolar	]			37,471	43,146	22,999
Digital MOS	]			533,081	740,108	348,167
Microprocessors	]			93,868	122,723	65,709
Logic	]			121,894	162,025	87,014
Memories	]			317,318	455,360	195,444
Hybrid	]			36,771	46,467	25,580
Unpackaged	95,632	87,101	92,344	131,890	193,288	95,900
Parts	n.a.	n.a.	n.a.	107,653	96,118	54,236
Discrete Devices (excl. parts)	114,755	116,137	131,406	168,814	188,894	99,429
Packaged	98,212	98,791	111,112	146,024	162,604	85,225
Transistors	30,429	28,505	33,227	56,931	64,090	35,371
Diodes and Rectifiers	24,247	25,658	30,576	41,663	43,486	22,083
Light-Emitting Diodes				20,419	24,393	11,544
Other	] 43,536	44,629	47,309	27,011	30,635	16,226
Unpackaged	16,543	17,346	20,294	22,790	26,290	14,204
Parts	n.a.	n.a.	n.a.	19,978	21,403	11,030
Total Exports (excl. parts)	696,556	639,268	723,779	1,014,521	1,336,675	661,102

Table 3B: Japan's Exports of Semiconductors to the United States, 1985-90

(in millions of yen*)

	1985	1986	1987	1988	1989	Six Months 1990
Integrated Circuits (excl. parts)	Y219,537	Y163,940	Y195,391	Y291,350	Y434,720	Y205,670
Packaged	207,244	154,737	180,980	258,664	381,712	180,169
Analog	]			9,547	11,989	7,022
Digital Bipolar	]			17,849	18,811	11,626
Digital MOS	]			221,300	337,899	153,969
Microprocessors	]			22,132	25,136	13,205
Logic	]			46,011	58,157	34,309
Memories	]			153,157	254,606	106,455
Hybrid	]			9,968	13,014	7,552
Unpackaged	12,292	9,203	14,411	32,686	53,007	25,501
Parts	n.a.	n.a.	n.a.	32,608	29,613	15,897
Discrete Devices (excl. parts)	28,788	21,997	21,618	22,562	26,671	15,155
Packaged	26,683	20,108	19,820	20,651	24,762	14,182
Transistors	6,032	5,036	5,261	8,363	10,667	6,517
Diodes and Rectifiers	3,778	3,907	3,630	3,708	4,353	2,047
Light-Emitting Diodes				4,494	5,393	3,285
Other	] 16,873	11,164	10,929	4,086	4,348	2,333
Unpackaged	2,106	1,889	1,798	1,911	1,910	973
Parts	n.a.	n.a.	n.a.	2,138	2,440	1,370
Exports to United States (excl. parts)	248,325	185,937	217,008	313,912	461,391	220,824

*The following average annual exchange rates, calculated by the Ministry of Finance, can be used to convert the yen export figures into dollars: 1985, Y240.29; 1986, Y169.99; 1987, Y145.90; 1988, Y128.13; 1989, Y137.34; and January-June 1990, Y150.83.

Source: Japan Tariff Association, Japan Exports and Imports: Commodity by Country.

Table 4A: Japan's Total Imports of Semiconductors, 1985-90

(in millions of yen*)

	1985	1986	1987	1988	1989	Six Months 1990
Integrated Circuits (excl. parts)	Y165,439	Y146,075	Y162,728	Y225,710	Y310,226	Y183,057
Packaged	137,851	118,895	132,780	186,212	252,003	144,680
Analog	]			40,539	55,771	30,013
Digital Bipolar	]			31,537	37,468	23,001
Digital MOS	]			100,230	141,741	83,598
Microprocessors	]			43,712	57,445	32,970
Logic	]			28,841	32,704	22,416
Memories	]			27,677	51,592	28,213
Hybrid	]			13,906	17,023	8,067
Unpackaged	27,588	27,180	29,948	39,498	58,223	38,377
Parts	n.a.	n.a.	n.a.	1,263	1,566	1,026
Discrete Devices (excl. parts)	33,985	26,688	26,355	31,027	41,433	22,928
Transistors	]			13,601	17,592	9,656
Diodes and Rectifiers	]			7,019	11,215	6,198
Light-Emitting Diodes	]			4,009	4,198	2,585
Other	]			6,397	8,428	4,489
Parts	n.a.	n.a.	n.a.	352	765	1,008
Total Imports (excl. parts)	199,424	172,763	189,082	256,737	351,659	205,984

Table 4B: Japan's Imports of Semiconductors from the United States, 1985-90

(in millions of yen*)

	1985	1986	1987	1988	1989	Six Months 1990
Integrated Circuits (excl. parts)	Y125,381	Y110,085	Y119,225	Y166,242	Y220,578	Y133,473
Packaged	102,160	88,179	94,807	134,710	175,232	103,417
Analog	]			21,047	28,680	16,087
Digital Bipolar	]			22,600	25,363	15,452
Digital MOS	]			82,560	110,936	66,935
Microprocessors	]			40,818	54,517	30,667
Logic	]			20,966	19,184	14,180
Memories	]			20,776	37,235	22,089
Hybrid	]			8,503	10,254	4,944
Unpackaged	23,222	21,906	24,418	31,532	45,347	30,056
Parts	n.a.	n.a.	n.a.	962	1,252	813
Discrete Devices (excl. parts)	10,712	7,779	7,304	9,615	12,217	6,227
Transistors	]			4,251	5,136	2,701
Diodes and Rectifiers	]			1,563	2,042	1,065
Light-Emitting Diodes	]			1,107	1,763	867
Other	]			2,694	3,277	1,594
Parts	n.a.	n.a.	n.a.	140	103	33
Imports from United States (excl. parts)	136,093	117,865	126,529	175,857	232,795	139,700

*The following average annual exchange rates, calculated by the Ministry of Finance, can be used to convert the yen import figures into dollars: 1985, Y240.17; 1986, Y170.08; 1987, Y146.01; 1988, Y128.15; 1989, Y137.26; and January-June 1990, Y150.71.

Source: Japan Tariff Association, Japan Exports and Imports: Commodity by Country.

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